

### § 23.53

by the applicant and must not be less than the greatest of the following:

- (i)  $V_1$ ;
- (ii)  $1.05 V_{MC}$  determined under § 23.149(b);
- (iii)  $1.10 V_{S1}$ ; or
- (iv) The speed that allows attaining the initial climb-out speed,  $V_2$ , before reaching a height of 35 feet above the takeoff surface in accordance with § 23.57(c)(2).

(3) For any given set of conditions, such as weight, altitude, temperature, and configuration, a single value of  $V_R$  must be used to show compliance with both the one-engine-inoperative takeoff and all-engines-operating takeoff requirements.

(4) The takeoff safety speed,  $V_2$ , in terms of calibrated airspeed, must be selected by the applicant so as to allow the gradient of climb required in § 23.67(c)(1) and (c)(2) but must not be less than  $1.10 V_{MC}$  or less than  $1.20 V_{S1}$ .

(5) The one-engine-inoperative takeoff distance, using a normal rotation rate at a speed 5 knots less than  $V_R$ , established in accordance with paragraph (c)(2) of this section, must be shown not to exceed the corresponding one-engine-inoperative takeoff distance, determined in accordance with § 23.57 and § 23.59(a)(1), using the established  $V_R$ . The takeoff, otherwise performed in accordance with § 23.57, must be continued safely from the point at which the airplane is 35 feet above the takeoff surface and at a speed not less than the established  $V_2$  minus 5 knots.

(6) The applicant must show, with all engines operating, that marked increases in the scheduled takeoff distances, determined in accordance with § 23.59(a)(2), do not result from over-rotation of the airplane or out-of-trim conditions.

[Doc. No. 27807, 61 FR 5184, Feb. 9, 1996]

### § 23.53 Takeoff performance.

(a) For normal, utility, and acrobatic category airplanes, the takeoff distance must be determined in accordance with paragraph (b) of this section, using speeds determined in accordance with § 23.51 (a) and (b).

(b) For normal, utility, and acrobatic category airplanes, the distance required to takeoff and climb to a height of 50 feet above the takeoff surface

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must be determined for each weight, altitude, and temperature within the operational limits established for takeoff with—

- (1) Takeoff power on each engine;
- (2) Wing flaps in the takeoff position(s); and
- (3) Landing gear extended.

(c) For commuter category airplanes, takeoff performance, as required by §§ 23.55 through 23.59, must be determined with the operating engine(s) within approved operating limitations.

[Doc. No. 27807, 61 FR 5185, Feb. 9, 1996]

### § 23.55 Accelerate-stop distance.

For each commuter category airplane, the accelerate-stop distance must be determined as follows:

(a) The accelerate-stop distance is the sum of the distances necessary to—

(1) Accelerate the airplane from a standing start to  $V_{EF}$  with all engines operating;

(2) Accelerate the airplane from  $V_{EF}$  to  $V_1$ , assuming the critical engine fails at  $V_{EF}$ ; and

(3) Come to a full stop from the point at which  $V_1$  is reached.

(b) Means other than wheel brakes may be used to determine the accelerate-stop distances if that means—

- (1) Is safe and reliable;
- (2) Is used so that consistent results can be expected under normal operating conditions; and
- (3) Is such that exceptional skill is not required to control the airplane.

[Amdt. 23–34, 52 FR 1826, Jan. 15, 1987, as amended by Amdt. 23–50, 61 FR 5185, Feb. 9, 1996]

### § 23.57 Takeoff path.

For each commuter category airplane, the takeoff path is as follows:

(a) The takeoff path extends from a standing start to a point in the takeoff at which the airplane is 1500 feet above the takeoff surface at or below which height the transition from the takeoff to the enroute configuration must be completed; and

(1) The takeoff path must be based on the procedures prescribed in § 23.45;

(2) The airplane must be accelerated on the ground to  $V_{EF}$  at which point the